A TWO-STAGE REAL ESTATE DEVELOPMENT PROJECT PORTFOLIO SELECTION AND SCHEDULING DECISION-MAKING SYSTEM

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SEPTEMBER 2010

CITY UNIVERSITY OF HONG KONG
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A TWO-STAGE REAL ESTATE DEVELOPMENT PROJECT PORTFOLIO SELECTION AND SCHEDULING DECISION-MAKING SYSTEM
一個兩階段房地產開發項目組合選擇和進度安排的決策系統

Submitted to
Department of Building and Construction
建築系
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy
哲學博士學位

by

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September 2010
二零一零年九月

ABSTRACT

This research aims to propose a two-stage real estate development project portfolio selection and its scheduling (RED-PPS-S) Decision-making System, which consists of two critical and interrelated decision-making sub-systems, namely, RED project portfolio selection (RED-PPS) Decision-making System and RED scheduling (RED-S) Decision-making System to solve the practical PPS and scheduling problems in RED decision-making process. When developers engage in multi-project development, an optimal PPS and its scheduling can assist the decision makers to allocate the capital resources efficiently while the risks are mitigated to realize the corporate goals. Extensive literature reviews show that only limited research concerning the critical decision-making phases of RED-PPS and its scheduling have been done as most developers only focus on individual project development, and thus the optimization of the corporate capital resource in RED projects cannot be materialized as they are not considered holistically. Since most Chinese medium-sized developers are required to run multiple development projects simultaneously, the results of this research will assist those developers with the said decision-making phases. Moreover, this research will bridge the research gap by proposing a two-stage RED-PPS-S Decision-making System, which can integrate corporate long-term goals under the optimization objectives of maximize profit and minimize risk, and short-term goals under the optimization objectives of maximizing the minimum value of cumulated net cash flow and minimizing the value of breakeven time of cumulated net cash flow to assist developers' decision makers to implement optimal capital resource allocation.

This research focused on the decision-making process of PPS and its scheduling by Chinese medium-sized developers. An optimal project portfolio is selected as the output of the multiple objectives optimization (MOO) process in which intuitive judgment from decision makers is considered. Both traditional project evaluation methods and real option theory are adopted for the valuation of each project, which could assist decision makers to include the benefits of the uncertainty and development flexibility in decision-making. Based on the results from the selected project portfolio, the RED-S Decision-making System assists decision makers to select an optimal project portfolio scheduling through cash flow forecasting under different scenarios. The efficacy and efficiency of the proposed RED-PPS-S Decision-making System were tested and verified by a practical case in which six idle land plots were required to be handled. The results after comparison show that the proposed RED-PPS-S Decision-making System is both effective and efficient in helping decision makers to select an optimal RED project portfolio and project portfolio scheduling. In the case study, the net present value of the project portfolio is increased 25.5 million RMB, the present value of total cost 61.3 million RMB is reduced and the total comprehensive risk coefficient is decreased by 58.6%. The minimum value of cumulated net cash flow of project portfolio scheduling is increased 29.8 million RMB.

Keywords: Real estate development, Project portfolio selection, Project portfolio scheduling, Decision-making system, PSO algorithms, Intuitionistic fuzzy Choquet integral.

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